Variability of the upper ocean stratification in the North Atlantic Salinity Maximum region

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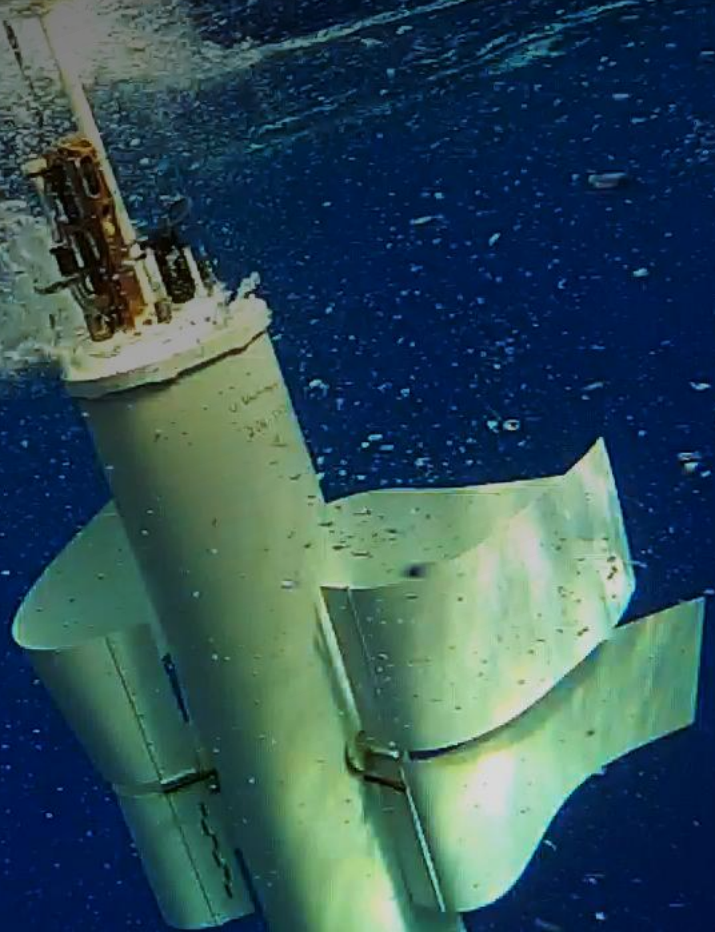
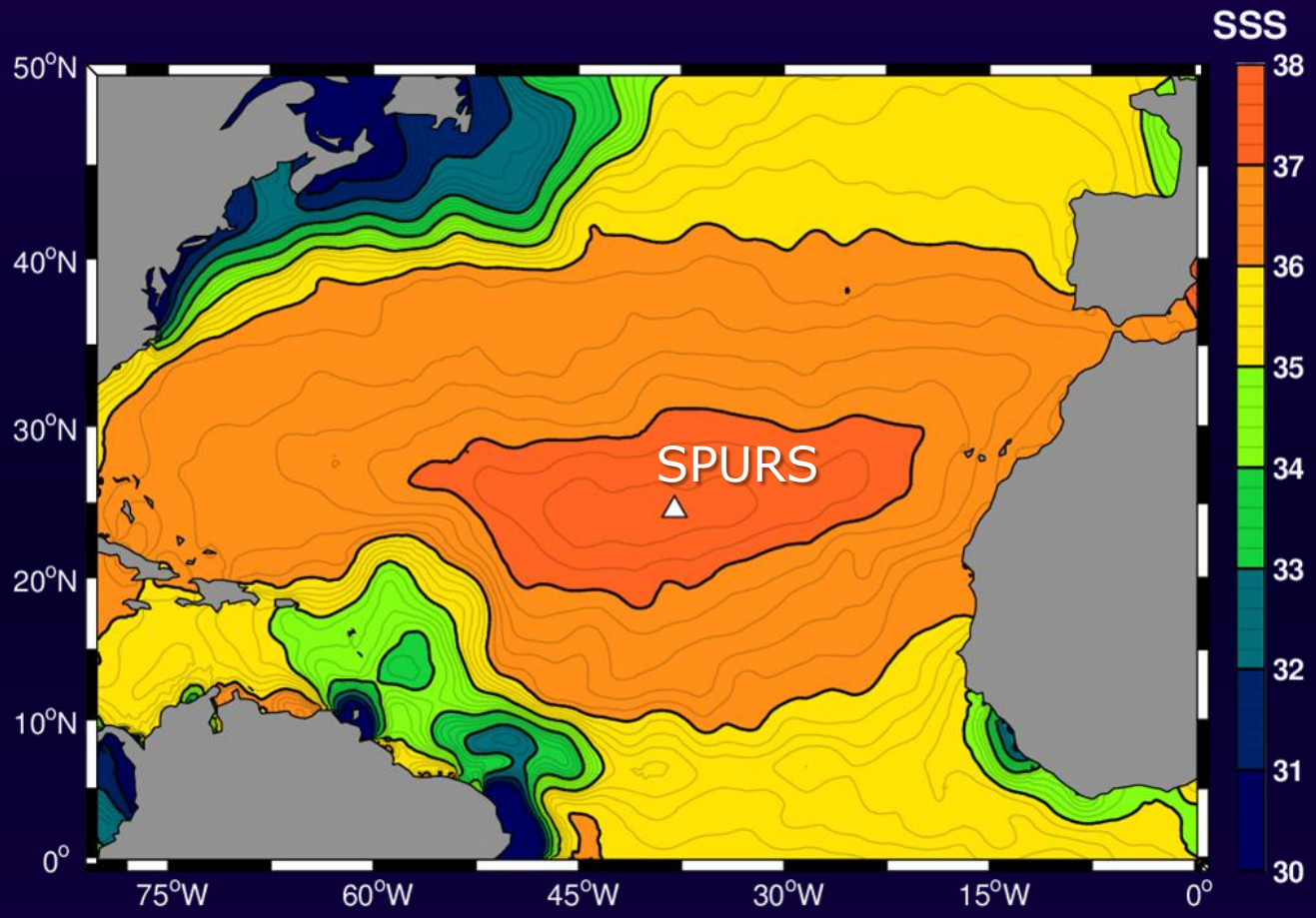
Eric D'Asaro



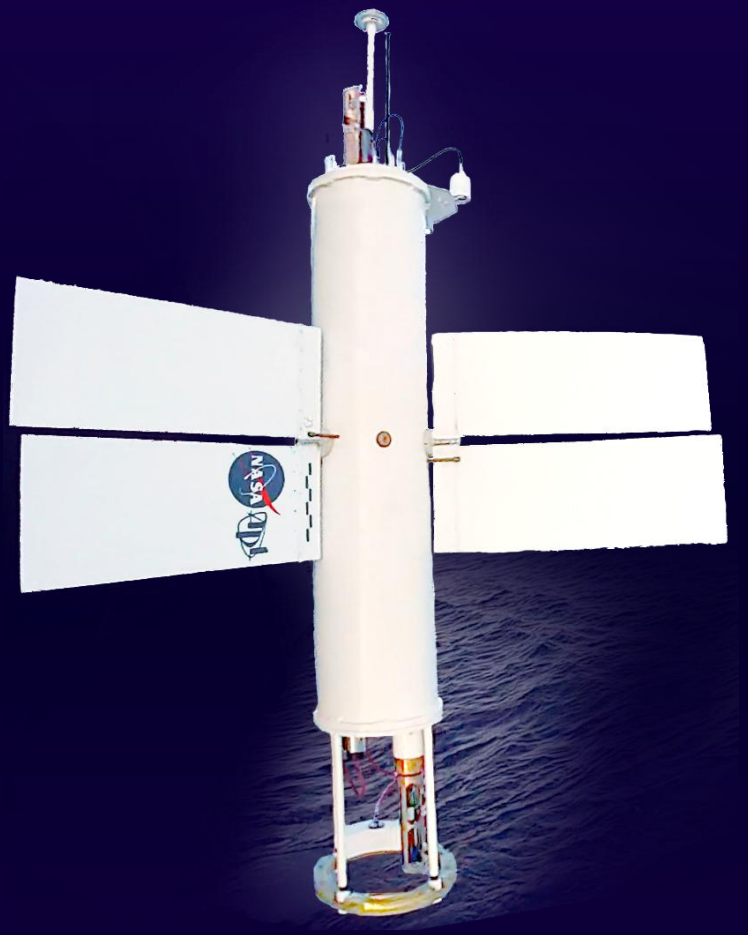
North Atlantic Salinity Maximum

NASA Salinity Processes in the Upper Ocean Regional Study (SPURS)



Climatological summer sea surface salinity (World Ocean Atlas 2005)

Mixed-layer Lagrangian Float (MLF)



2 x CTD + surface Salinity

2 x Pressure

Ambient noise spectra

Buoyancy control accurate to 1g

"Wings" for drag

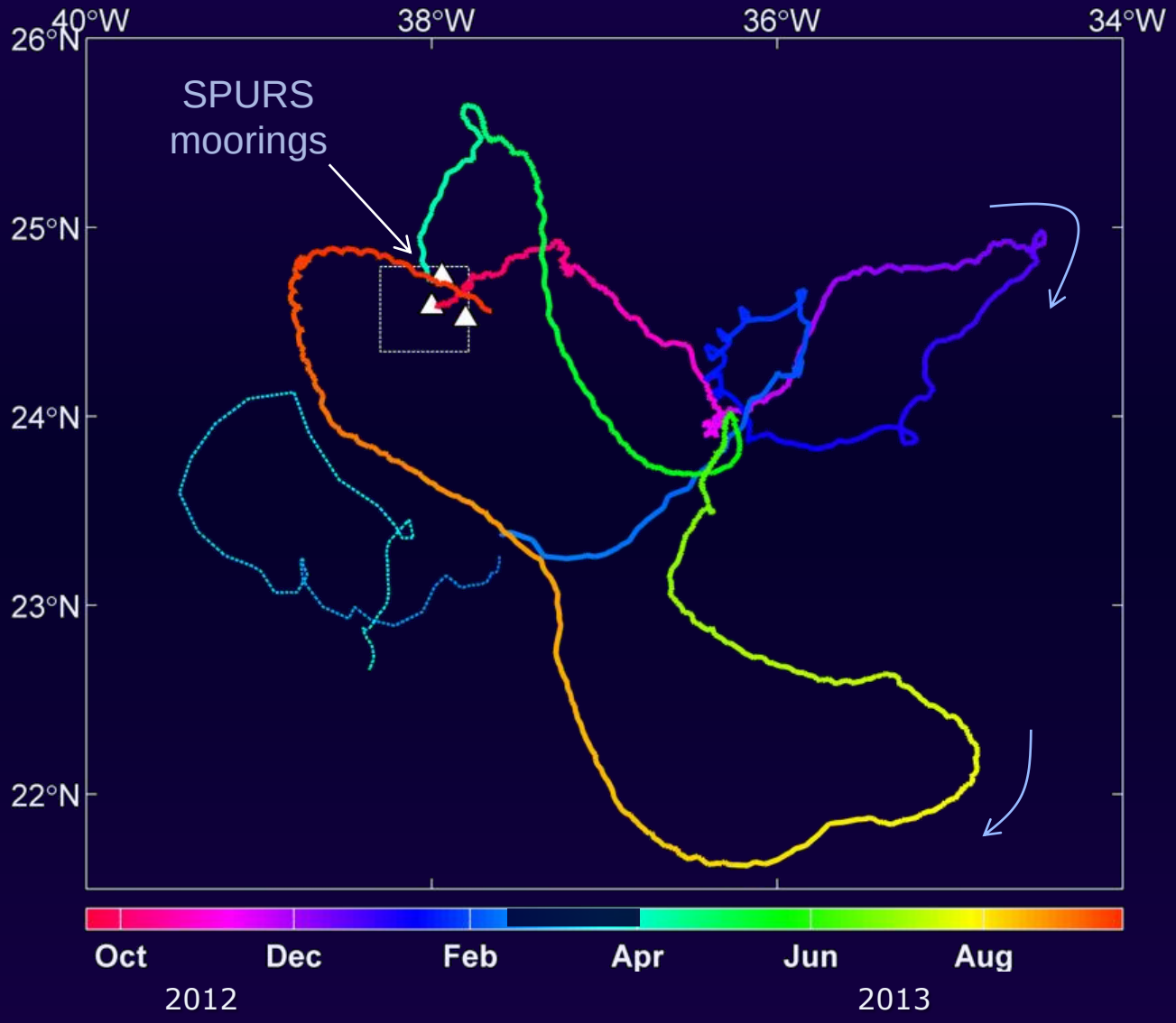
Iridium + GPS

Camera

Aggressive anti-fouling

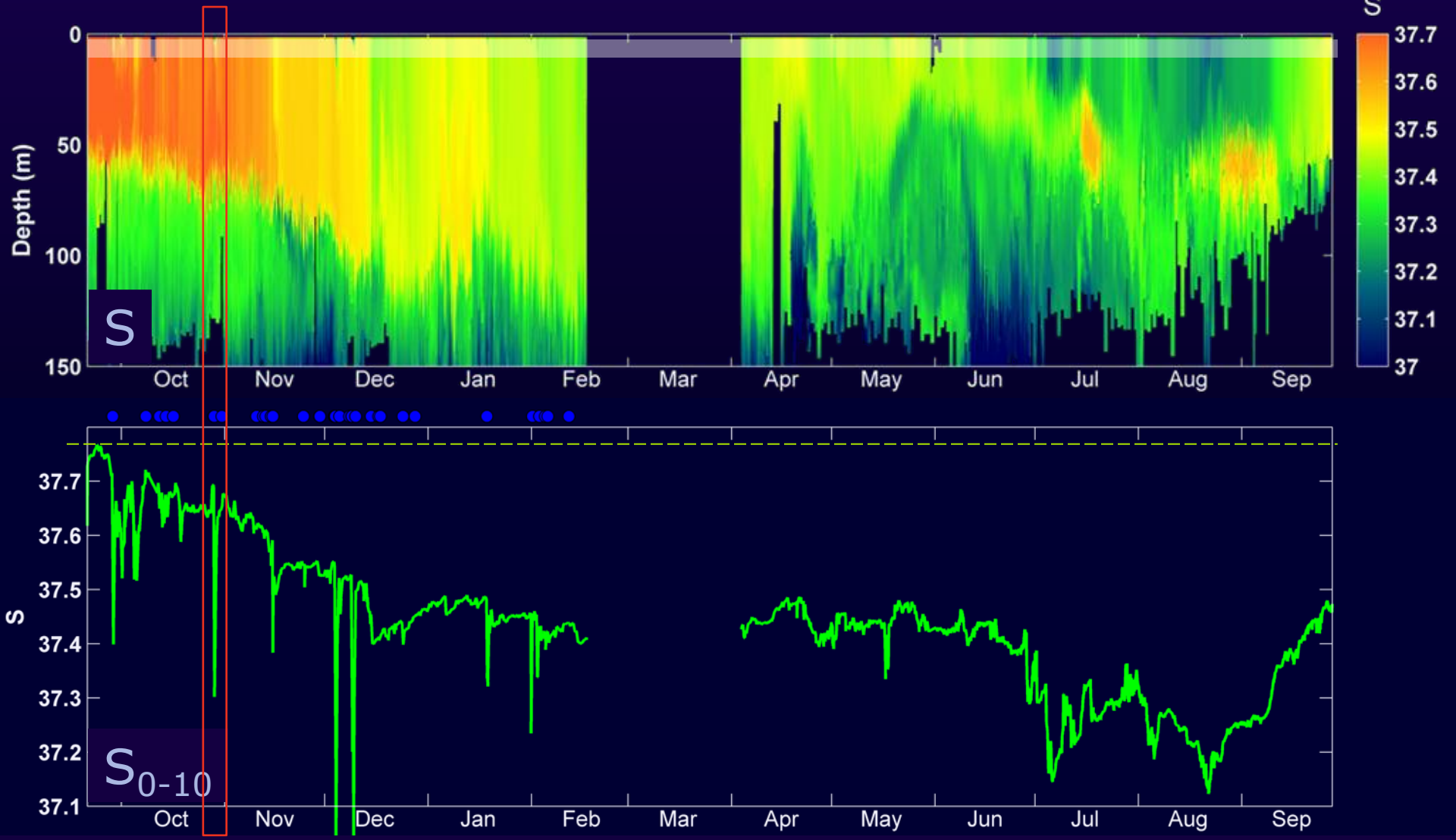
Following advection of the upper 100m

Drift of 2 floats spans a year, Sep. 2012 – Sep. 2013



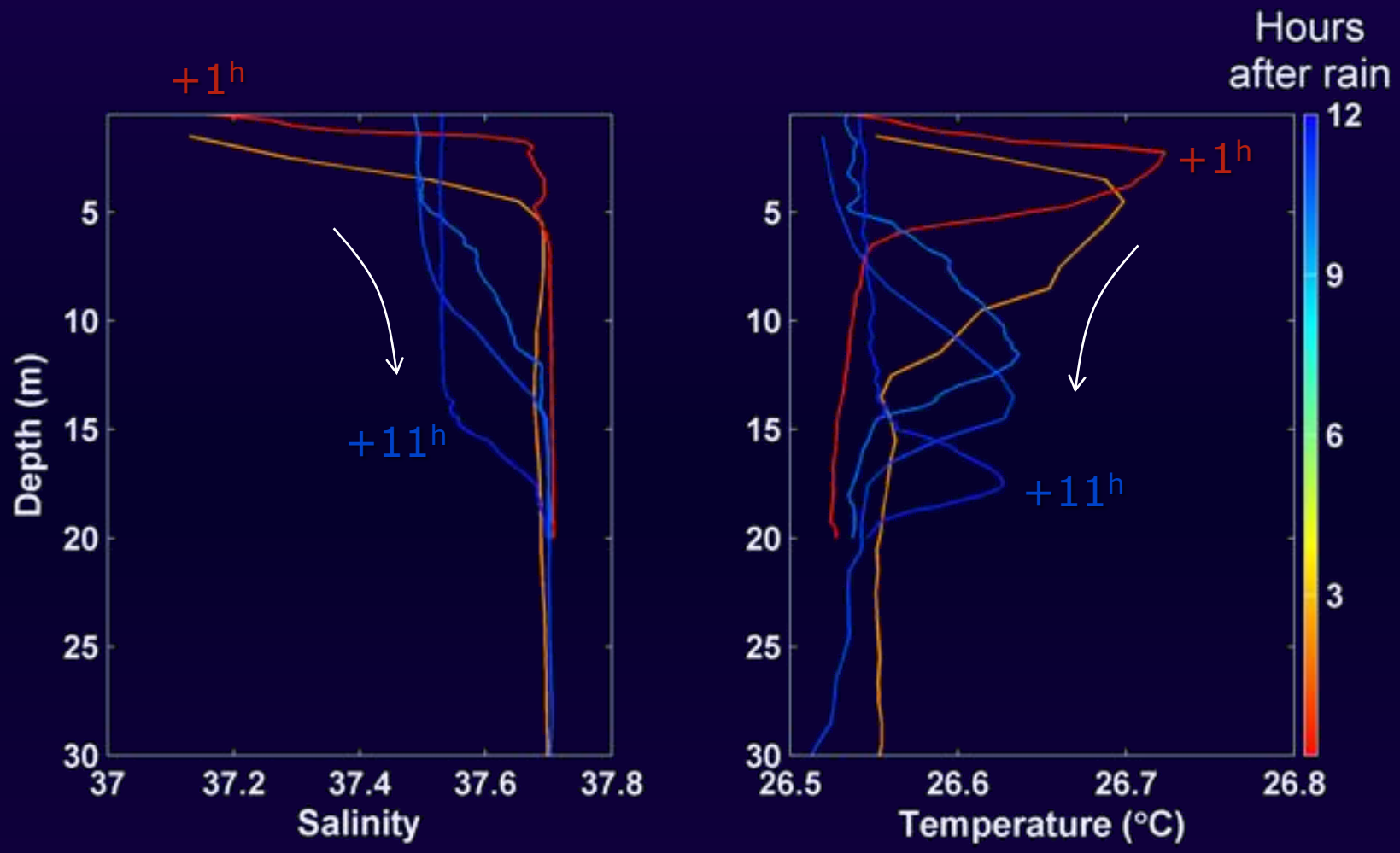
Thermohaline structure evolution

Sep. 2012 – Sep. 2013



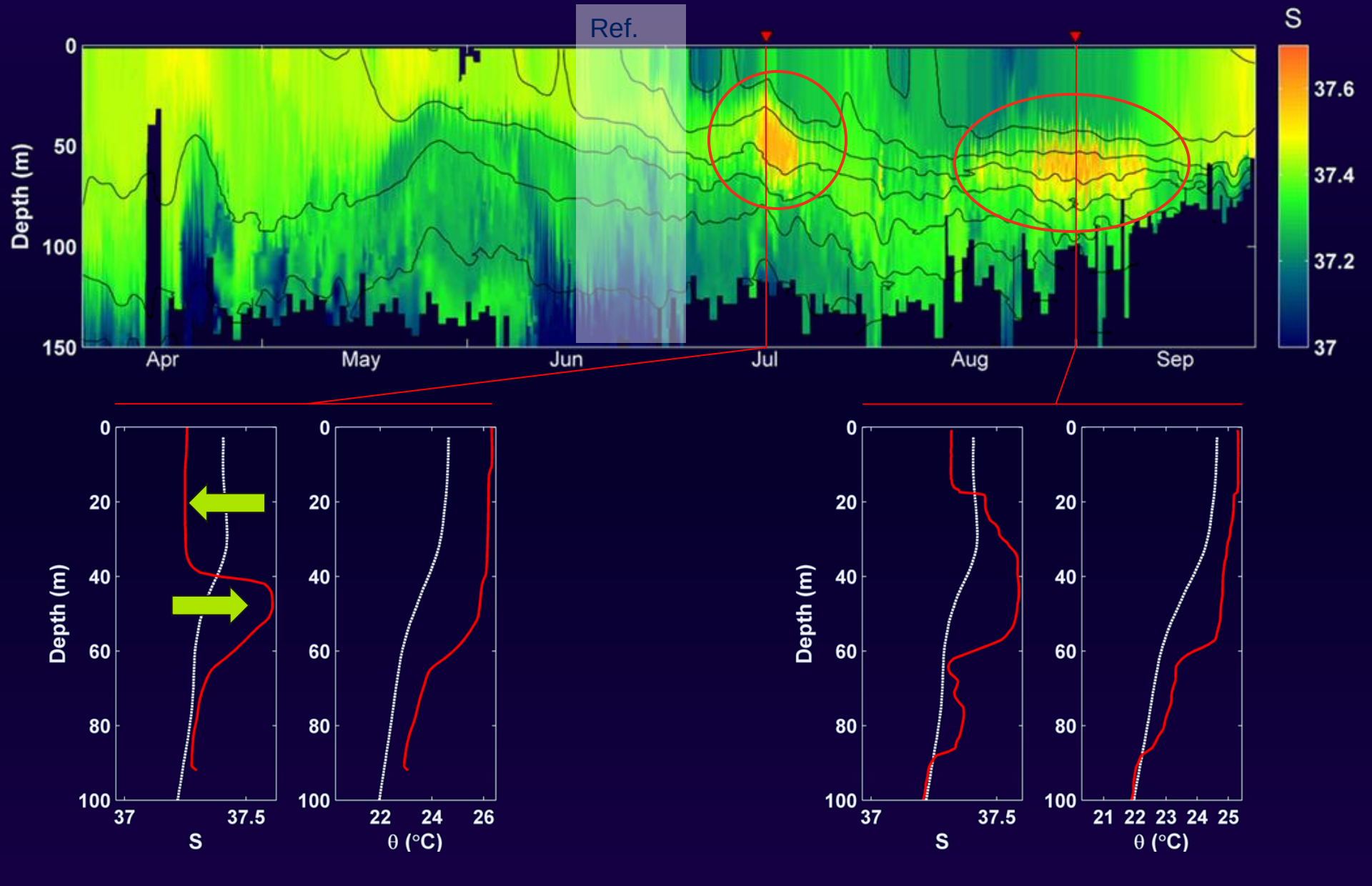
Transient rainwater pools

Fresh water mixes away in a day. T_{max} is mixed downward.



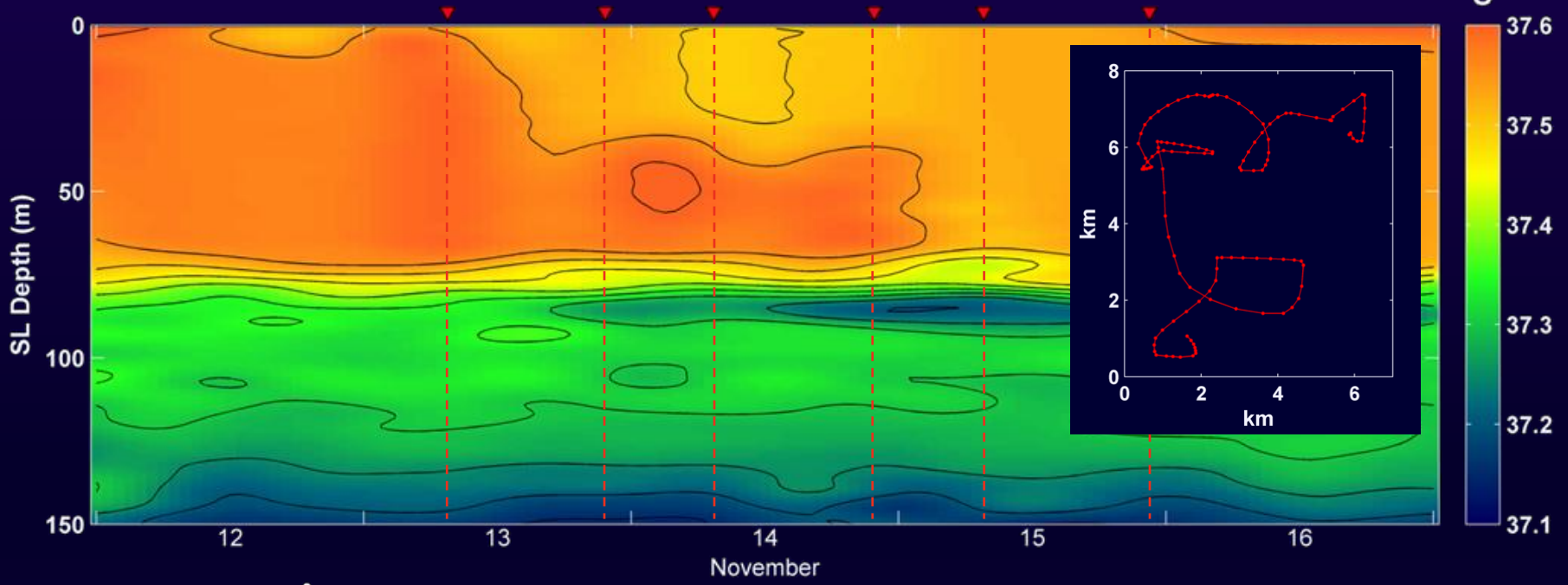
High-salinity “intrusions” below the ML

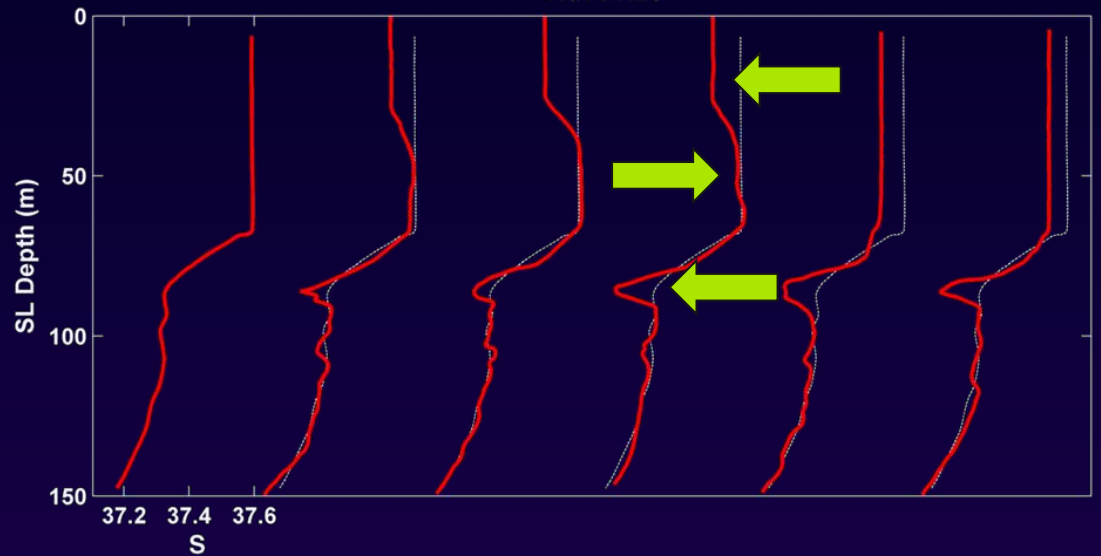
Newly-subducted portions of the Subtropical Underwater?



Formation of interleaving features

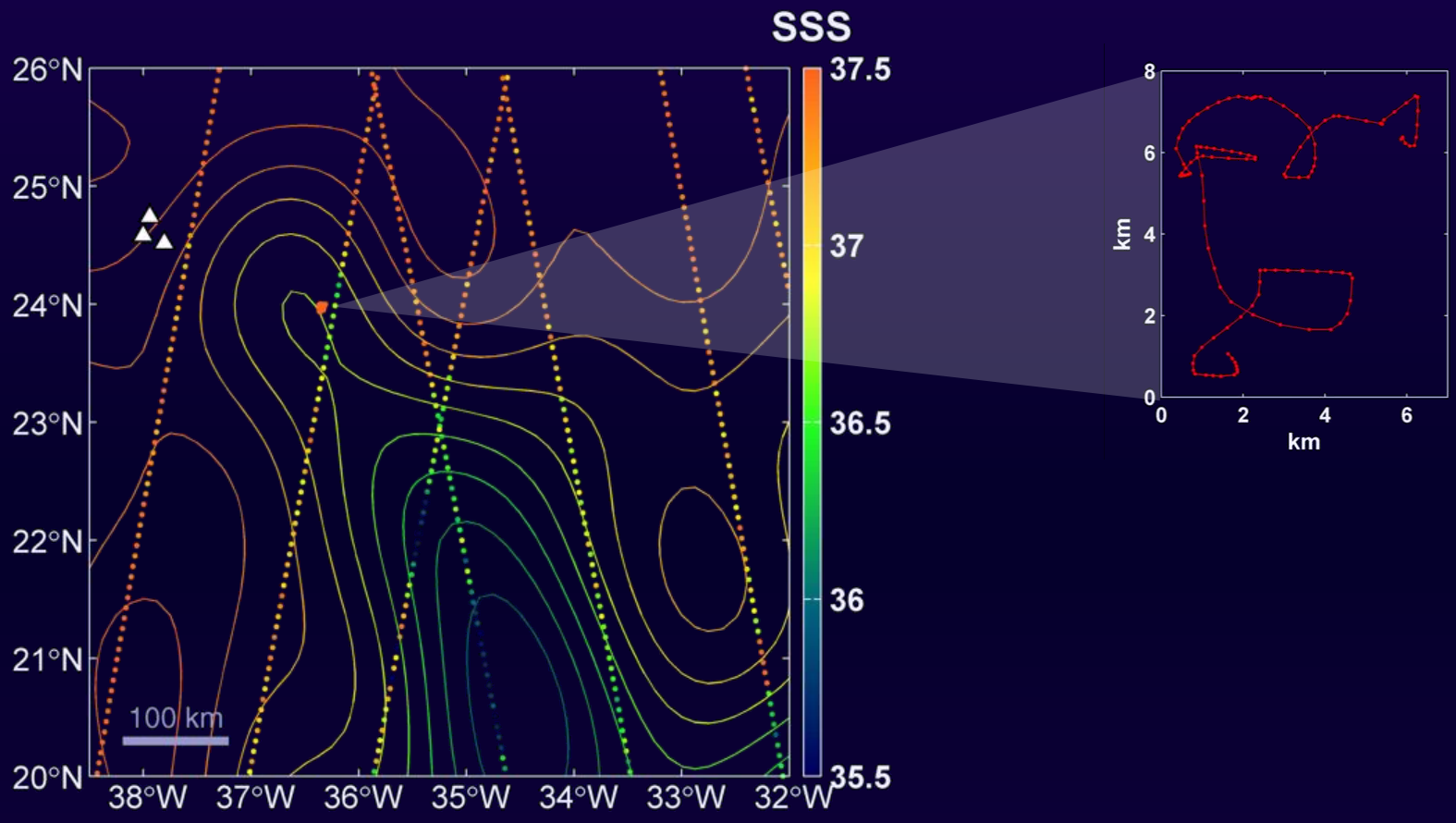
A result of mixed layer instability?





Interleaving occurred at the edge of mesoscale feature

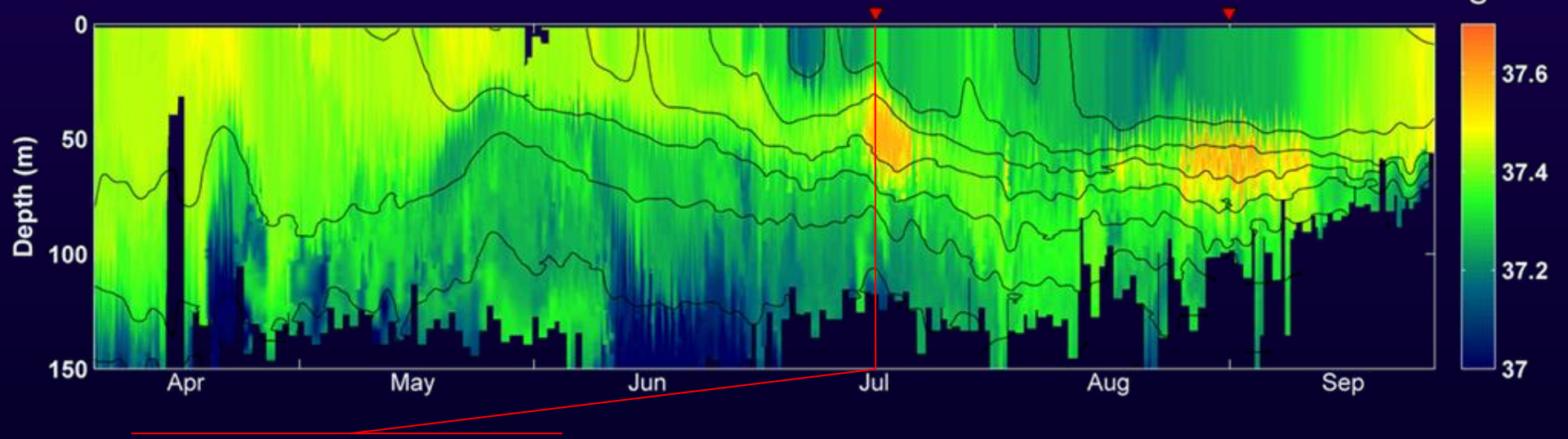
According to Aquarius SSS

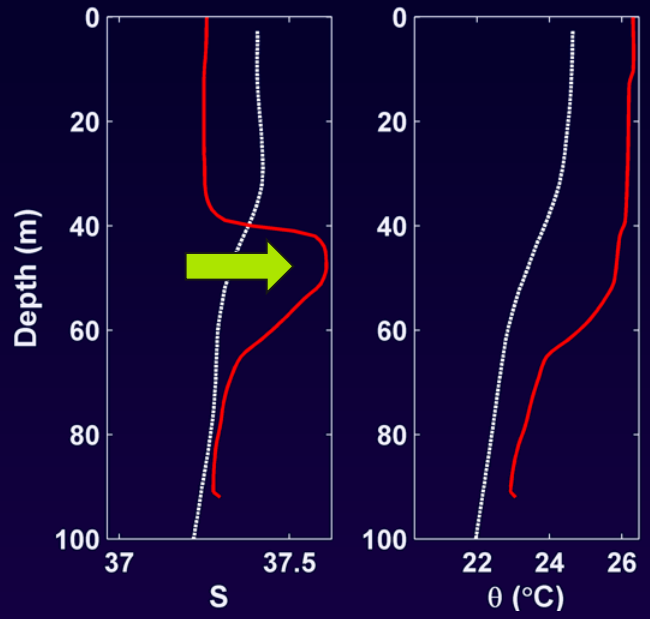


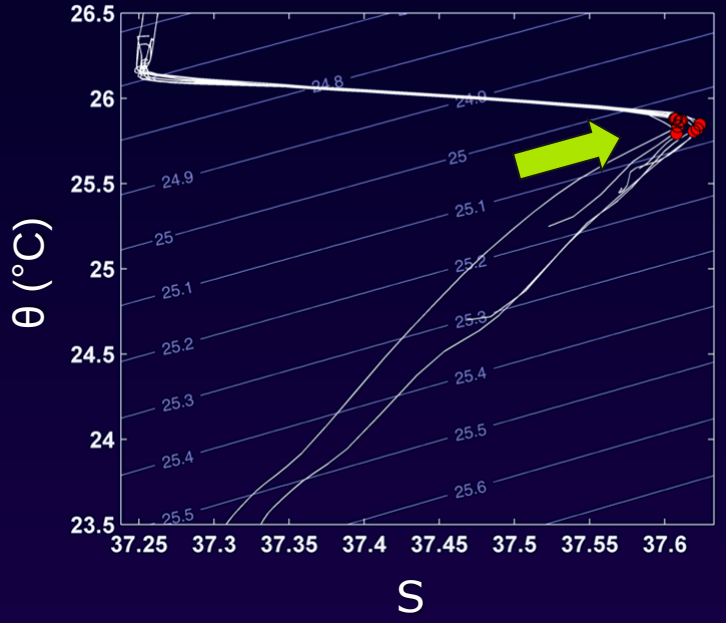
Aquarius SSS provided by PO.DAAC/JPL/NASA

Where does high-S water originate?

Must come from the ML somewhere!





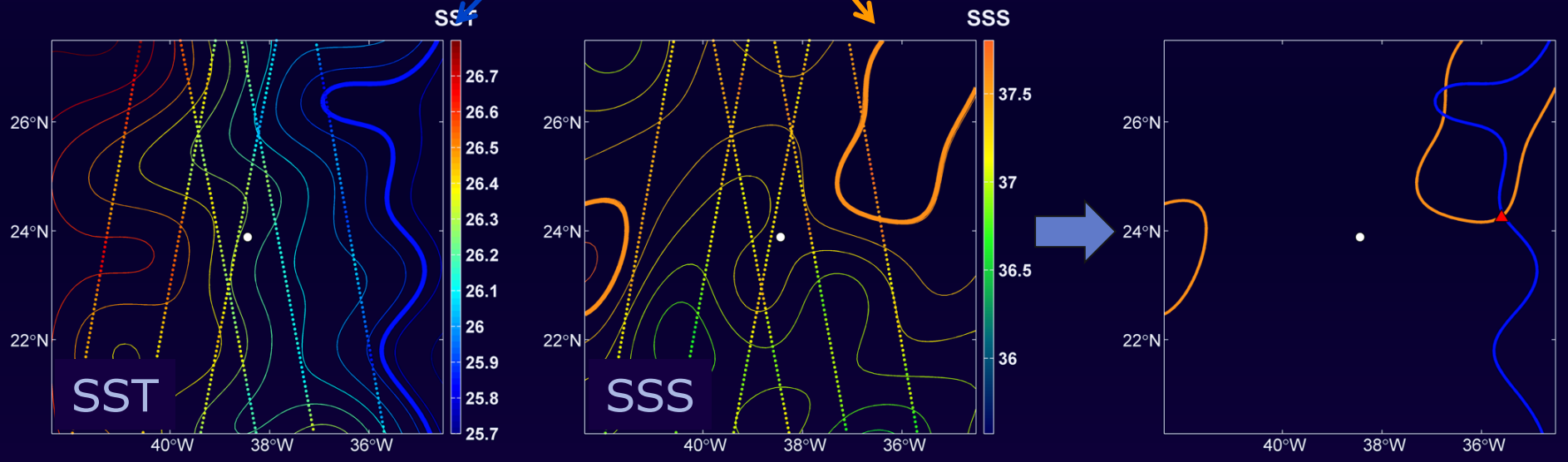


$(T, S)_{intrusion}$

Where does high-S water originate?

Using Aquarius swath data to locate similar TS

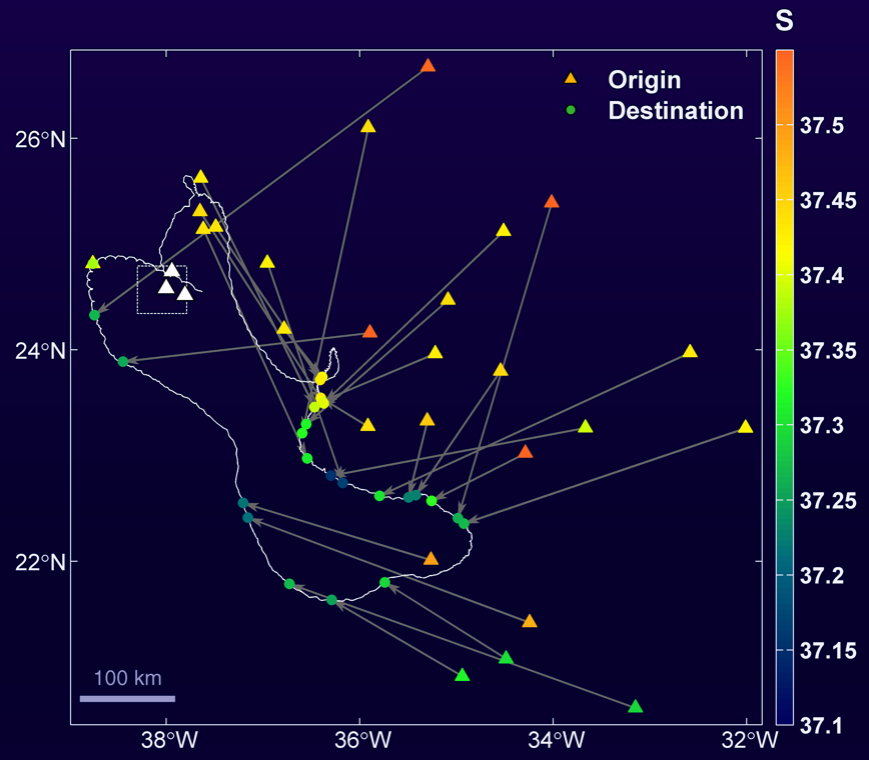
$(T, S)_{intrusion}$

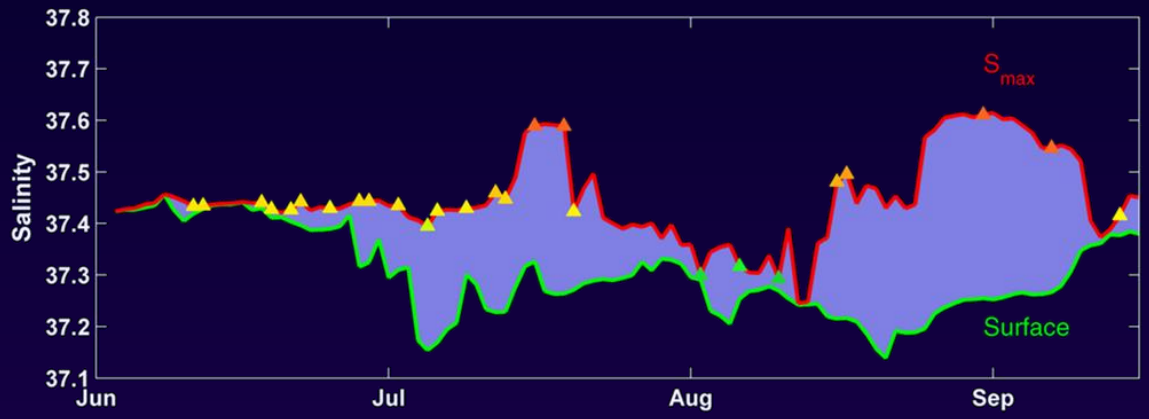


Aquarius SSS & NOAA OISST provided by PO.DAAC/JPL/NASA

High-S water found east of the SPURS site

Typically from100–300km away





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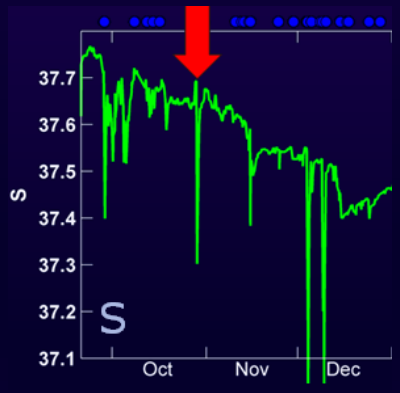
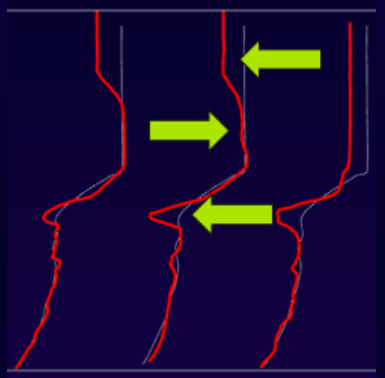
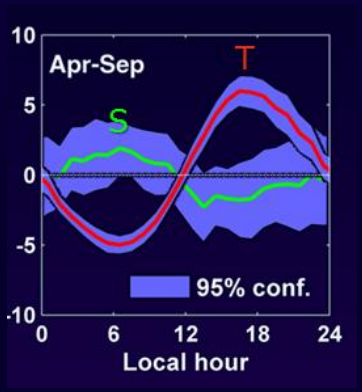
Rain pools



Submesoscale interleaving



Diel cycle



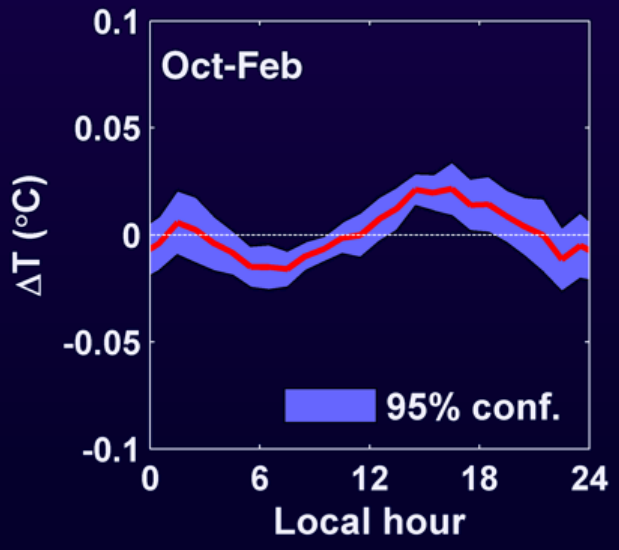
Next:

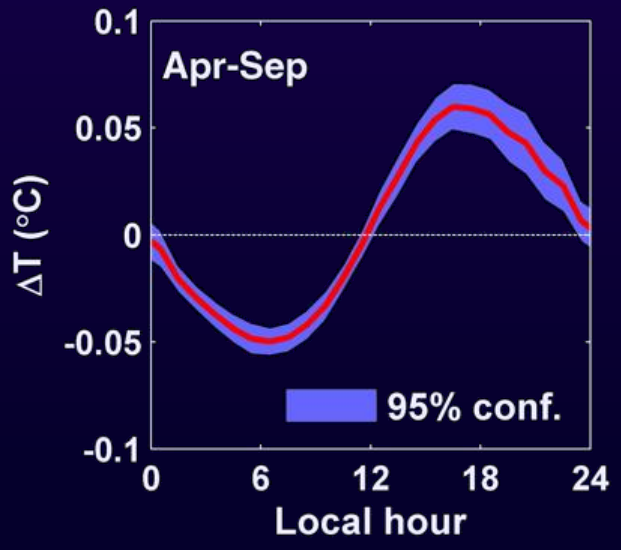
Inter-comparison and synthesis with other SPURS efforts

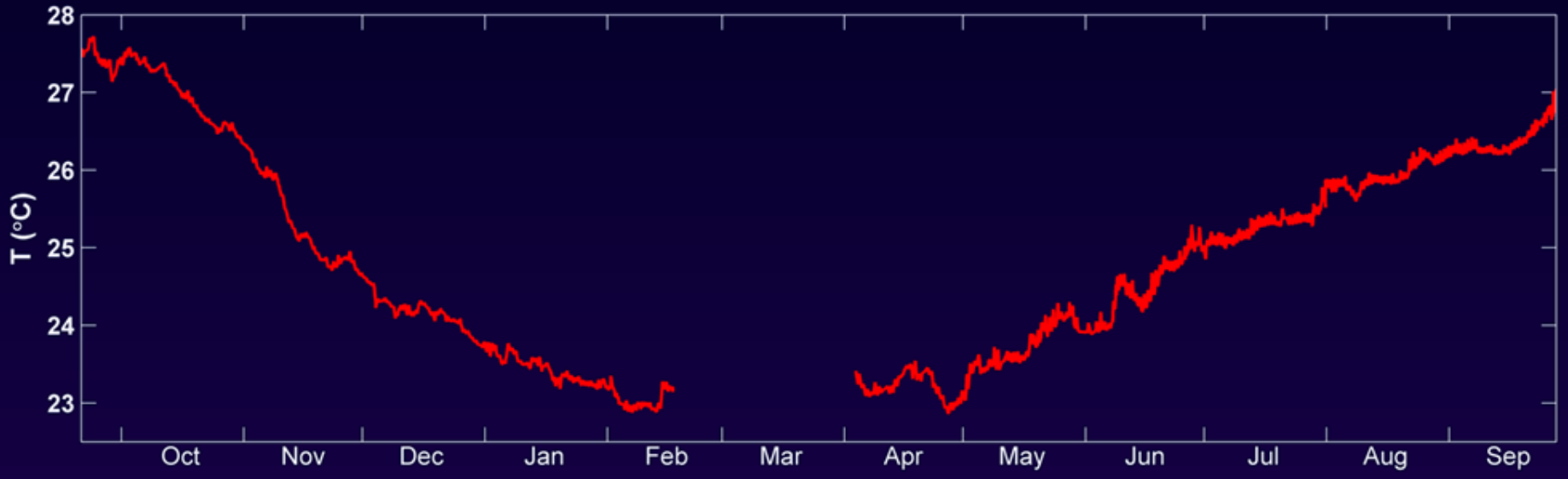
(ARGO floats, S drifters, gliders, moorings, numerical models)

Diel temperature cycle

(composite)

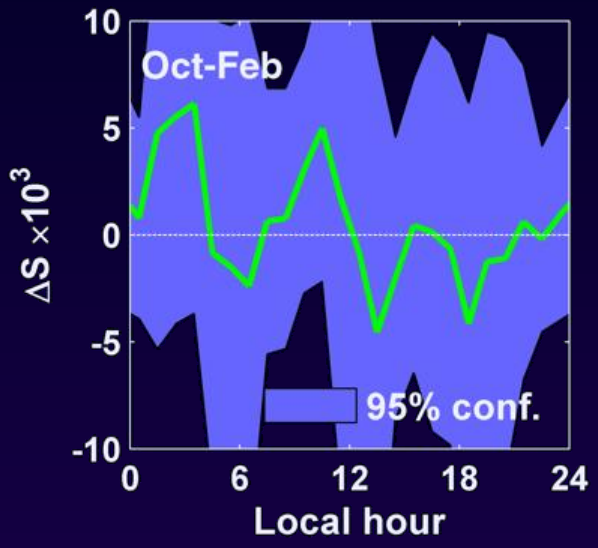


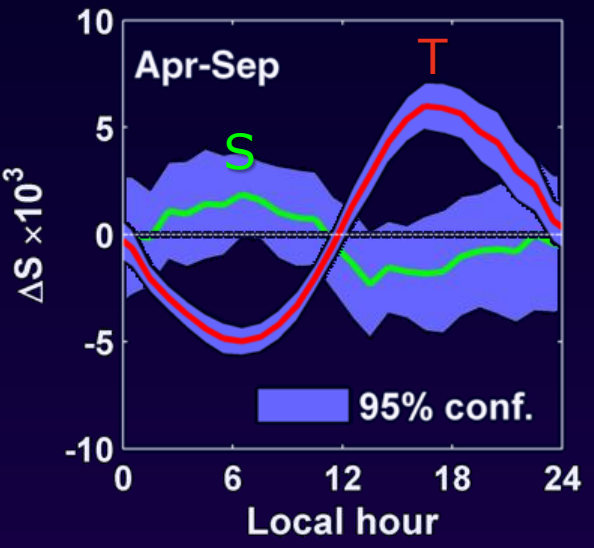




Diel salinity cycle

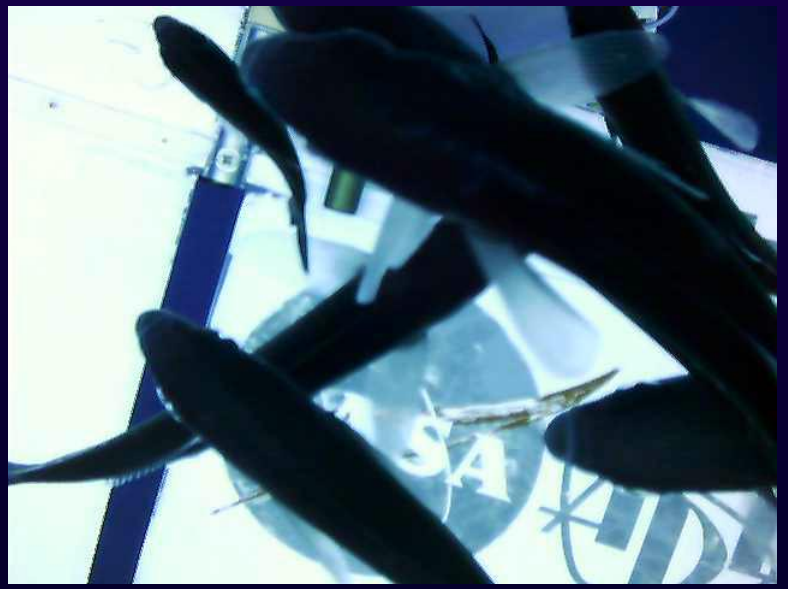
Weak and obscured by rain events in the fall. Entrainment in summer?





Main problem: fish

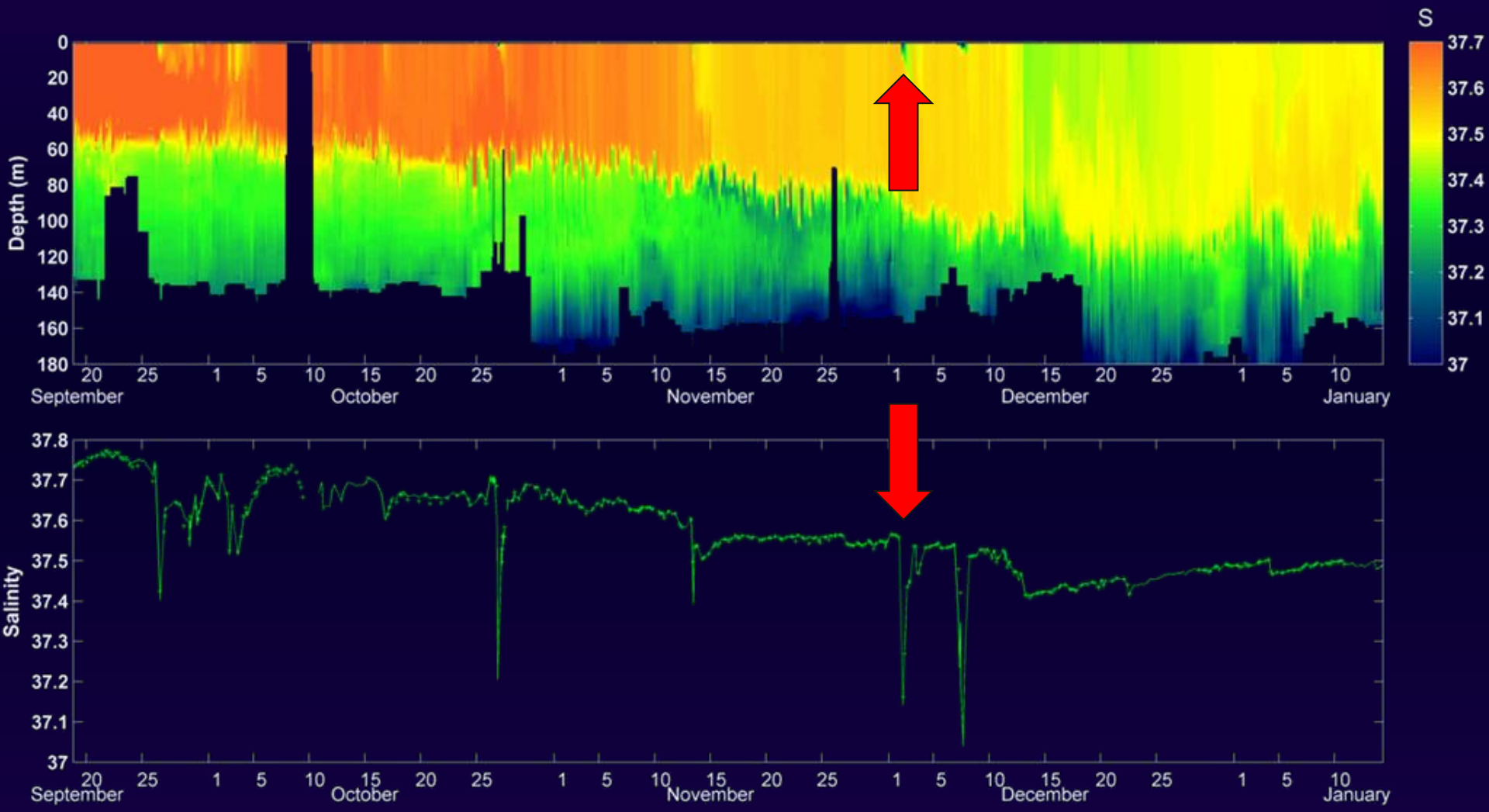
Affect ballasting at night. Mostly gone now.



Seasonal cycle of near-surface T&S

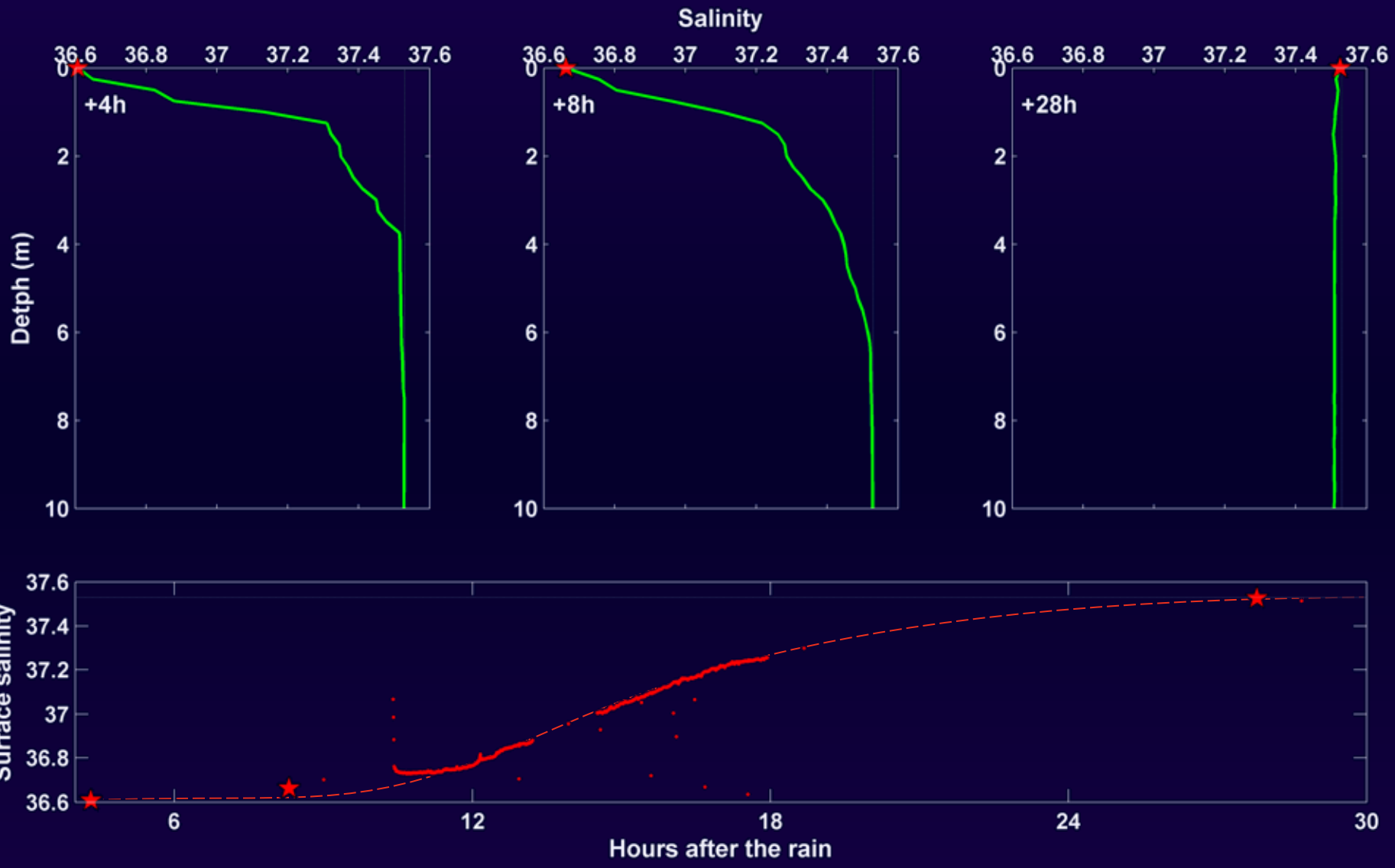
When it rains, it pools

Transient freshwater pools associated with local rain events



Fresh pool evolution

Fresh water is mixed away in a day



Density ratio & Turner angle diagram

You (2002), McDougall et al. (1998)